Voyager 3100 Series
User's Guide

MAN-VOY3100UG-001

Rev. A1

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Scope

This manual describes the installation and configuration of Eurologic's Voyager 3100 product. All the standard configurations are explained.

WARNING: Only trained service personnel should perform changes to this unit.

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Chapter 1: Introduction

This manual gives instructions on how to install configure and use the Voyager 3100 product. The Voyager 3100 product contains several configurable components allowing it to adapt from a JBOD (Just a bunch of disks) to a Workstation/ Workgroup RAID Subsystem.

The system is available as a pedestal stand-alone system or as a rackmountable configuration.

The Voyager 3100 product is available with a SCSI - Low Voltage Differential integrated controller with Intelligent Terminator.

or

A Fibre Channel integrated controller with Intelligent Terminator.

or

JBOD Intelligent Terminator only.

Features

The main features of the Voyager 3100 include:

- Choice of Ultra2 or Fibre Channel RAID controller
- Versatile Environmental Monitor monitors disk drives, power supplies, Advanced Cooling Modules and enclosure temperature.
- Works with any operating system without additional software drivers
- All SCSI channels support Wide Ultra2 SCSI (80 MBytes/sec)
- Supports full backward compatibility for asynchronous, fast, Ultra1 and Ultra2 SCSI
- RS-232 interface for mounting and configuring via a terminal
- Automatic termination through the Voyager 3100 Intelligent Terminator Module
- Auto-Ranging power supplies

Device Carrier

Front loaded components such as disk drives, power supplies and the RAID controller are housed in easily removable device carriers. The device carrier is the basic building block of the series. The device carriers are manufactured using a high quality anodized metal construction. This allows for rapid heat dissipation and conforms to the stringent requirements of CE and FCC standards.

Power Supplies

The Voyager 3100 system supports two 300 Watt hot swappable, auto-sensing power supplies. Each power supply provides sufficient 12V and 5V to support a fully populated system with 10,000 RPM disk drives and a RAID controller. The power source can be AC or DC if used with the Eurologic 48V power supply module.

When configured as AC there are dual AC inputs. When configured as DC there is a single DC input. The power supply module contains all the power sharing and load balancing components, thus keeping the active components off the backplane. When populated with two power supplies you provide N+1 redundancy.

Advanced Cooling Modules (ACM)

The Voyager 3100 shelf contains three 4-speed ACMs. When all three ACMs are fully operational they will spin at their lowest rotational speed. This provides N+1 redundancy and produces the lowest db of sound.

The ACM installs directly into the backplane and is fixed in place at the rear of the shelf by two thumbscrews.

Intelligent Terminator Module

If **no** RAID Controller is installed, the Intelligent Terminator Module will be the only component in the top slot. If a RAID controller **is** installed then the Intelligent Terminator Module will be installed with the controller. The Intelligent Terminator Module allows the selection of either Single or Dual Bus configurations when used in JBOD shelves by using the manual switch on the rear of the shelf. If a RAID controller is installed in the shelf then the SCSI bus for that shelf will always be split into two SCSI busses.

The Intelligent Terminator Module also provides termination for the split bus.

RAID Controllers

The Voyager 3100 system supports the following RAID Controllers:

- Voyager 3110: Ultra2 Host, 2 x Ultra2 Drive Channels
- Voyager 3120: Fibre Channel Host, 3 x Ultra2 Drive Channels

The controller is installed in a removable controller carrier for easy insertion into the Voyager 3100 shelf. Inside the controller carrier is the following;

- RAID Controller (Voyager 3110 or Voyager 3120)
- Voyager 3100 Intelligent Terminator Module
- Battery for cache backup

Configurations

The following table shows the standard configurations available for the Voyager 3100. For more detailed information on how these configurations are created, refer to Chapter 3.

Table 1-1 Standard Configurations

Product	No. of Voyager 3100 disk shelves	RAID Controller Type	VEM
Single Bus JBOD 6 drives	1	None	Optional
Single Bus JBOD 12 drives	2	None	Optional
Dual Bus JBOD 6 drives	1	None	Optional
Dual Bus JBOD 12 drives	2	None	Optional
Ultra2 RAID 6 drives	1	1 x Voyager 3110	Optional
Ultra2 RAID 12 drives	2	1 x Voyager 3110	Optional
Ultra2 RAID 18 drives	3	1 x Voyager 3110	Optional
Fibre Channel RAID 6 drives	1	1 x Voyager 3120	Optional
Fibre Channel RAID 12 drives	2	1 x Voyager 3120	Optional
Fibre Channel RAID 18 drives	3	1 x Voyager 3120	Optional
Fibre Channel RAID 24 drives	4	1 x Voyager 3120	Optional
Fibre Channel RAID 30 drives	5	1 x Voyager 3120	Optional
Fibre Channel RAID Dual Controllers	1	2 x Voyager 3120	Optional

Chapter 2: Unpacking and Initial Setup

On receipt of the system visually inspect the exterior of the packaging for any signs of damage. If any damage is found the carrier and Eurologic should be informed and they will advise you of the appropriate action. The cartons are sealed using packaging tape which should be cut open in the normal manner. Remove the top foam layer from each box and exercise caution when lifting out the components. At this point the contents should be verified against the packing list and Eurologic should again be notified if any discrepancies exist. The devices and power supply units are packaged in anti-static packaging and anti-static precautions must be observed prior to removal. The devices and power supply units can now be inserted into the tower or shelf.

Recommendations for Installing a Voyager 3100 Rackmount System in a Standard 19in. Rack

It is essential that the following guidelines are complied with to ensure the safe and efficient operation of the Voyager 3100 computer equipment. Eurologic's rackmount systems may be installed in closed or open rackmount systems by observing the environmental, electrical and mechanical precautions listed in the following paragraphs.

Ambient Temperature

Installation of rackmount systems in a standard 19in. cabinet may lead to a differential between the room ambient temperature and the ambient temperature of the surrounding environment. The maximum operating temperature of the Voyager 3100 product is 40 degrees centigrade, however, it is not recommended that the system is continuously run at these elevated temperatures. Consideration should therefore be given to ensuring that the room ambient temperature is compatible with these specifications.

Air Flow

To ensure that the internal heat build up is adequately dissipated into the room environment, air flow should not be restricted. It is essential that no vents are blocked, and that the system is a minimum of 1 meter away from a solid surface such as a wall or partition. Air flow through the Voyager 3100 is from front to rear.

Mechanical Loading

Consideration should be given to the loading of the cabinet. To maintain a low center of gravity (thus reducing the likelihood of instability) racks should be installed (where possible) from the bottom of the cabinet upwards. This is essential to ensure personal safety.

Electrical Considerations

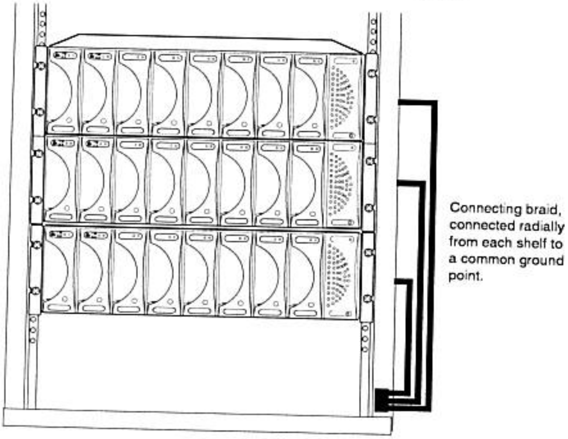
Circuit Overloading

Care should be taken to ensure that the current does not exceed the rating of the power source circuitry. This includes cabling, power distribution units, filters and any other components through which the main AC flows. The power requirements of the Voyager 3100 shelf is 1.5 Amps @ 200 Volts and 3 Amps @ 100 Volts[1] and must be added to the power demands of any other electrical devices installed in the cabinet to arrive at a total power consumption figure. In addition surge currents must be catered for. Disk drives normally consume twice the amount of current at start-up time as they do during steady state operation.

Grounding

Eurologic recommends that all rackmount shelves be grounded to a common point in the cabinet in a radial topology as shown in Figure 2-1.

Figure 2-1. Grounding shelves within a 19in. cabinet



Connecting braid, connected radially from each shelf to a common ground point.

A grounding point for securing the braid is provided at the rear of the rack mount shelf.

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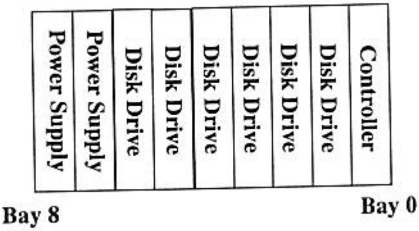
[1] This figure may vary slightly depending on the redundancy mechanisms incorporated, the number of device bays occupied and the device type occupying the bays.

Device Insertion

This section describes how to install the components such as disk drives, power supplies, controller carrier and advanced cooling modules. The installation of a disk shelf in a rack cabinet is also described. The position of the power supplies, disk drives and controller carrier within the Voyager 3100 shelf is shown in Figure 2-2.

Figure 2-2. Location of devices in Voyager 3100 shelf



WARNING: Before attempting to install or remove any of the components, ensure that anti-static precautions have been taken. The minimum requirement is an anti-static wrist strap and grounding wire.

Power Supply Insertion

The auto-ranging power supplies are housed in device carriers to allow for easy insertion. The power supply is designed for hot swappable operation.

1. Orient the power supply carrier so that the LEDs are on the left and the ejection button is on the right (for rackmount systems the LEDs and button are on the top and bottom respectively).
2. Insert the power supply carrier into either bay 7 or bay 8 of the RAID shelf (see Figure 2-2).
3. Push the carrier into the bay until you feel the power supply engage the backplane and the ejection button on the front is fully extended. If the button is not fully extended, apply additional pressure to the front of the device carrier.

4. Pull on the carrier to ensure that it does not come out and is locked in place.

Disk Drive Insertion

Disk drives are housed in device carriers to allow for easy insertion.

1. Orient the disk drive carrier so that the LEDs are on the left and the ejection button is on the right (for rackmount system the LEDs and button are on the top and bottom respectively).
2. Insert the disk drive carrier into any of the bays numbered bay 1 to bay 6 of the Voyager 3100 shelf (see Figure 2-2).
3. Push the carrier into the bay until you feel the disk drive engage the backplane and the ejection button on the front is fully extended. If the button is not fully extended, apply additional pressure to the front of the carrier until it is.
4. Pull on the carrier to ensure that it does not come out and is locked in place.

Advanced Cooling Module (ACM) Insertion

The Voyager 3100 is supplied with three ACMs mounted in the rear of the shelf. Any two of the ACMs are capable of cooling the entire shelf in the event of one of the ACMs failing. The ACMs are removable and hot swappable. The air flow created by the ACMs is from front to rear.

1. Hold the ACM assembly at 90 degrees to the Voyager 3100 tower or shelf.
2. Slide the ACM into the empty ACM slot.
3. Using the two thumbscrews on the ACM assembly, secure the ACM in place.

RAID Controller Insertion

The RAID controller is housed in a removable device carrier to allow for easy insertion and removal. The RAID controller carrier contains one of either the Voyager 3110 or Voyager 3120 RAID Controllers (see Chapter 4 for details).

Installing a RAID Controller

1. Orient the controller carrier so that the key hole is on the right.
2. Insert the key into the keyhole and insert the controller carrier into the top bay of the disk shelf.
3. Turn the key clockwise to secure the controller carrier in position.

Intelligent Terminator Module

The intelligent Terminator module is installed on the backplane of the Voyager 3100 systems. it sits in the top slot of the disk shelf. For systems with RAID Controllers installed the Intelligent Terminator Module will be enclosed in the RAID Controller Carrier. For JBOD systems (no RAID Controller), the Intelligent Terminator Module resides in the top slot but is covered by a blank carrier.

Rackmounting a Voyager 3100 Shelf

The Voyager 3100 product rack mount system can be installed in a standard 19 inch equipment rack. To ensure correct functionality of the rack mounted shelf the guidelines set out previously in this chapter regarding environmental, mechanical and electrical recommendations must be followed.

WARNING: When installing or removing a rack mount shelf, remove all power supplies and disk drives. It is recommended that you work with at least one other person when installing a disk shelf. This is necessary to prevent personal injury and damage to the shelf.

1. Install the guide rails supplied with the Voyager 3100 shelf rackmount system into the rack cabinet.
2. Onto the guide rails install the Voyager 3100 shelf and secure in place using the screws provided.

Chapter 3: Cabling and Configuration

This Chapter describes how to configure and set up the Voyager 3100 product. This chapter also describes the procedure for connecting the Voyager 3100 shelf to the host system.

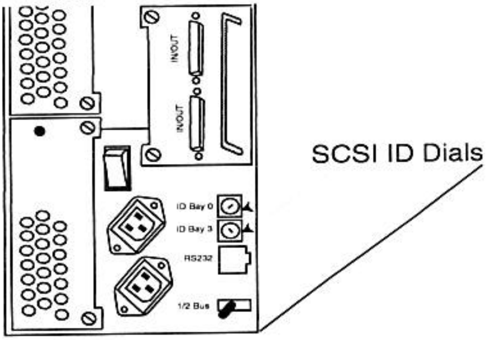
Each backplane will support 6 disk drives. Two power supplies will provide the power for the system and 3 Advanced Cooling Modules will provide the cooling.

The backplane also supports the Voyager 3110 or Voyager 3120 RAID Controllers and the Intelligent Terminator Module depending on the configuration of your Voyager 3100 system.

Setting SCSI ID's

The SCSI IDs for the devices within the Voyager 3100 shelf are set using the two 16-position ID dials located at the rear of the shelf (see Figure 3-1). The ID dials use Hexadecimal numbering.

Figure 3-1. Location of ID dials



The top ID dial sets the SCSI ID of disk drive 1, and the bottom ID dial sets the SCSI ID of disk drive 4. Disk drive 2 and 3 will be incriminated by one from the value shown on the top ID dial. Disk drive 5 and 6 will be incriminated by one from the value shown on the bottom ID dial. For example, if the value on the top ID Dial is set as ID 0 then disk drives 1, 2 and 3 will be assigned the SCSI IDs 0, 1, and 2 respectively. Similarly, if the value of the bottom ID Dial is set as ID 4, then disk drives 4, 5 and 6 will be assigned the SCSI IDs 4, 5, and 6 respectively. Sixteen SCSI IDs are available.

CAUTION: The SCSI IDs must be set at the values shown in the configuration diagrams that follow. This is necessary for Eurologic's Vision Software to function correctly.

Termination

With the Voyager 3100 product, termination is supplied automatically by the Intelligent Terminator Module which auto-senses where the end of the SCSI bus should be and supplies termination. There is no need to attach any external terminator connectors to the system.

1/2 Bus Switch

The 1/2 Bus Switch is located on the rear of the Voyager 3100 Storage Array. This switch enables the SCSI bus in the shelf to split into two SCSI busses or to be joined into one SCSI bus. To set the switch to have one SCSI bus this switch should be set to the left when looking at it from the rear of the shelf (see Figure 3-2). To set this switch to have two SCSI busses this switch should be set to the right when looking at it from the rear of the shelf (see Figure 3-3).

Figure 3-2. Setting the 1/2 bus switch to one SCSI bus

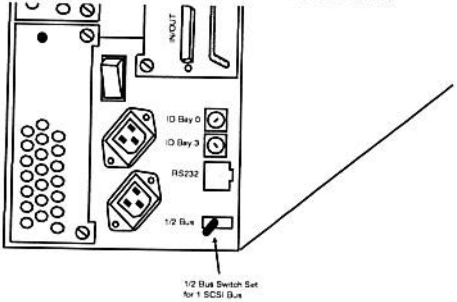
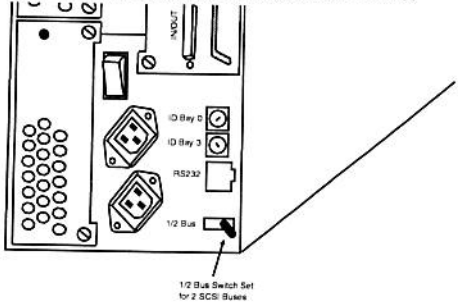


Figure 3-3. Setting the 1/2 bus switch to two SCSI busses



Cabling and Configuration

CAUTION: The disk shelves must be configured as shown in the configuration examples below. Ensure that the SCSI IDs are set as shown also.

This section describes the procedure for connecting the Voyager 3100 shelf to the host system. Each of the major configurations will be described, showing how shelves are daisy chained together and how the RAID controllers are connected.

The configurations available are:

- JBOD Configurations
- Ultra2 RAID Configurations
- Fibre Channel RAID Configurations

JBOD Configurations

This section will describe the cabling of the JBOD configuration described in Chapter 1. These configurations have no RAID Controller installed. The top slot will contain only the Intelligent Terminator Module.

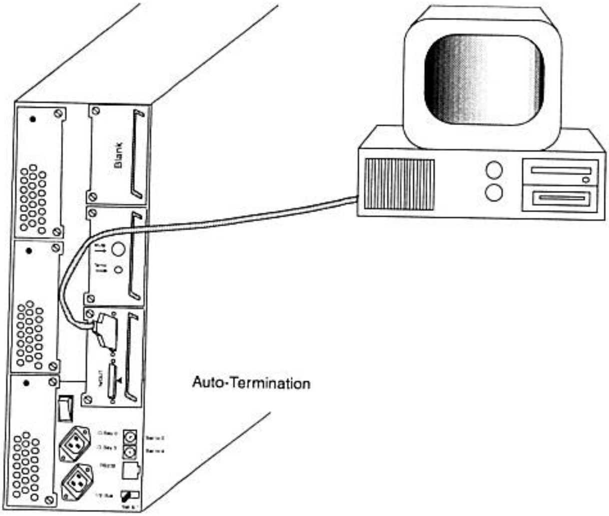
There are four standard JBOD configurations:

- Single Bus JBOD 6 Drives
- Single Bus JBOD 12 drives
- Dual Bus JBOD 6 drives
- Dual Bus JBOD 12 drives

Single Bus JBOD 6-drives

This configuration consists of a single Voyager 3100 shelf with an Intelligent Terminator Module in the top bay. A single cable connects the shelf to the host system which must have an Ultra2 LVD Host Adapter installed. The 1/2 Bus switch should be set to 1. Figure 3-4 shows how this configuration is cabled.

Figure 3-4. Single bus jbod 6 drives



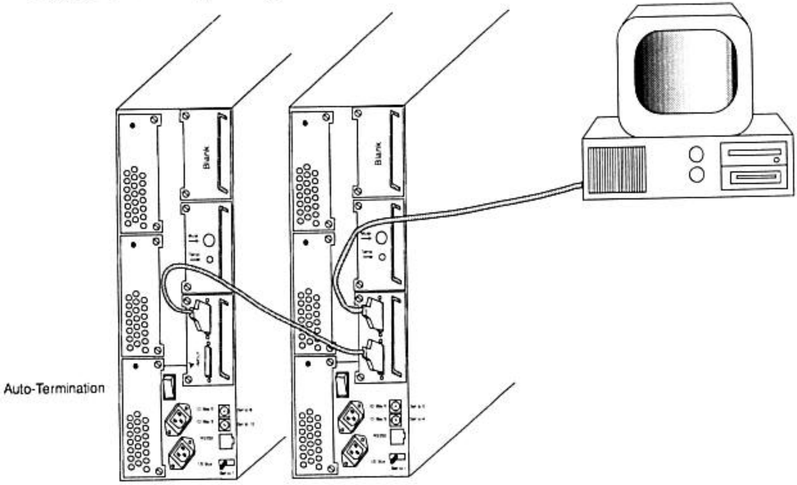
The SCSI ID mapping for this configuration is shown below.

JBOD SGL	
Ch0 ID0	
Ch0 ID1	
Ch0 ID2	VEM ID3
Ch0 ID4	
Ch0 ID5	
Ch0 ID6	
Power Sply	
Power Sply	

Single Bus JBOD 12-drives

This configuration consists of two Voyager 3100 shelves with an Intelligent Terminator Module in the top bay of each shelf (see Figure 3-5). Both shelves are daisy chained together and connected by a single cable to the host system which must have an Ultra2 LVD Host Adapter installed. The 1/2 Bus switch is set to 1 on both shelves. Figure 3-5 shows how this configuration is cabled.

Figure 3-5. Single bus jbod 12-drives



The SCSI ID mapping for this configuration is shown below.

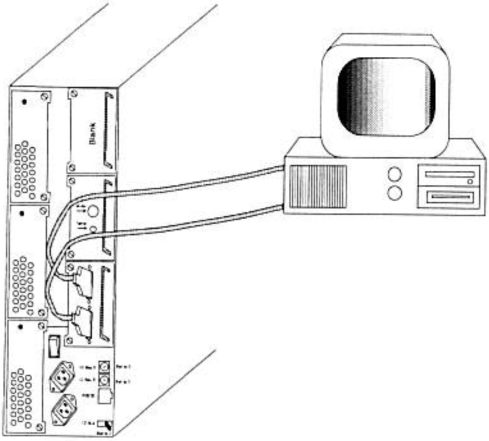
JBOD SGL	
Ch0 ID0	
Ch0 ID1	
Ch0 ID2	VEM ID3
Ch0 ID4	
Ch0 ID5	
Ch0 ID6	
Power Sply	
Power Sply	

JBOD SGL	
Ch0 ID8	
Ch0 ID9	
Ch0 ID10	VEM ID11
Ch0 ID12	
Ch0 ID13	
Ch0 ID14	
Power Sply	
Power Sply	

Dual Bus JBOD 6-drives

This configuration consists of a single Voyager 3100 shelf with a split Ultra2 SCSI bus. There is an Intelligent Terminator Module installed in the top bay (bay 0) and two cables connect the shelf to the host system which must have a Dual Channel Ultra2 LVD Host Adapter installed. The 1/2 Bus switch is set to 2. Figure 3-6 shows how this configuration is cabled.

Figure 3-6. Dual bus jbod 6-drives



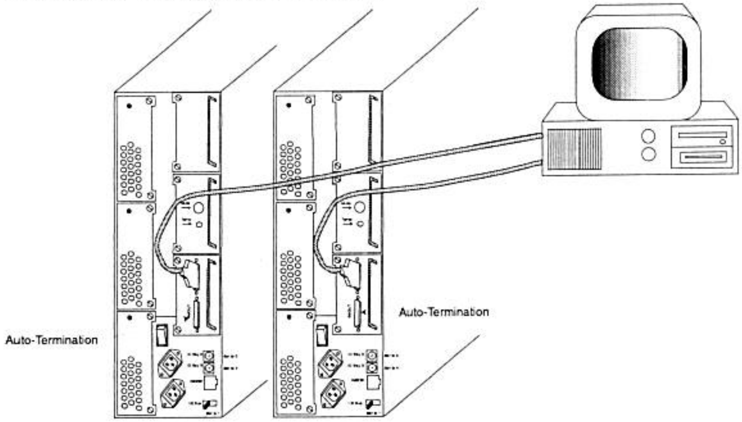
The SCSI ID mapping for this configuration is shown below.

JBOD Split	
Ch0 ID0	
Ch0 ID1	
Ch0 ID2	VEM ID3
Ch1 ID0	
Ch1 ID1	
Ch1 ID2	
Power Sply	
Power Sply	

Dual Bus JBOD 12-drives

This configuration consists of two Voyager 3100 shelves with an Intelligent Terminator Module (see Figure 3-7) installed in both shelves. Both shelves have a single cable connecting to the host system which must have a Dual Channel Ultra2 LVD Adapter installed. The 1/2 Bus switch is set to 1 on each shelf. Figure 3-7 shows how this configuration is cabled.

Figure 3-7. Dual bus jbod 12-drives



The SCSI ID mapping for this configuration is shown below.

JBOD SGL	
Ch0 ID0	
Ch0 ID1	
Ch0 ID2	VEM ID3
Ch0 ID4	
Ch0 ID5	
Ch0 ID6	
Power Sply	
Power Sply	

JBOD SGL	
Ch1 ID0	
Ch1 ID1	
Ch1 ID2	VEM ID3
Ch1 ID4	
Ch1 ID5	
Ch1 ID6	
Power Sply	
Power Sply	

Ultra2 RAID Configurations

This section will describe the cabling of the Ultra2 RAID configuration described in Chapter 1. These configurations have a Voyager 3110 RAID Controller installed in the controller carrier of one of the shelves along with the Intelligent Terminator Module. Subsequent shelves will have no Voyager 3110 Controller installed but will contain the Intelligent Terminator Module.

There are three standard Ultra2 RAID configurations:

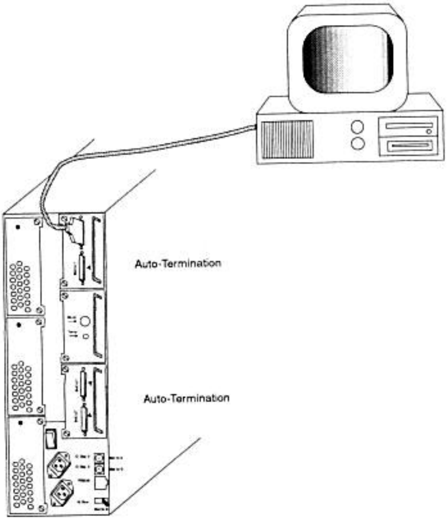
- Ultra2 RAID 6-drives
- Ultra2 RAID 12-drives
- Ultra2 RAID 18-drives

CAUTION: Ensure that the Bus Join Switch is set to 2 (switched to right) on the disk shelf that contains the RAID Controller.

Ultra2 RAID 6-drives

This configuration consists of a single Voyager 3100 shelf with a split Ultra2 SCSI bus. The controller carrier (top bay) will contain the Voyager 3110 RAID controller and the Intelligent Terminator Module. A single cable will connect the shelf to the host system which must have an Ultra2 LVD Host Adapter installed. The 1/2 Bus switch is set to 2. Figure 3-8 shows how this configuration is cabled.

Figure 3-8. Ultra2 RAID 6-drives



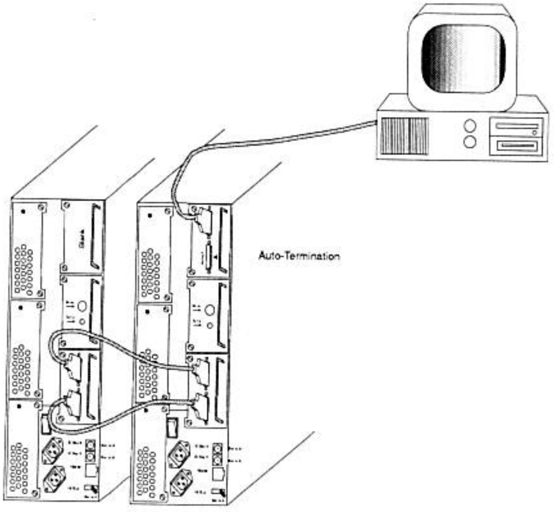
The SCSI ID mapping for this configuration is shown below.

Ultra2 RAID	
Ch0 ID0	
Ch0 ID1	
Ch0 ID2	VEM ID3
Ch1 ID0	
Ch1 ID1	
Ch1 ID2	
Power Sply	
Power Sply	

Ultra2 RAID 12-drives

This configuration consists of two Voyager 3100 shelves with one of the shelves containing the Voyager 3110 RAID Controller and the Intelligent Terminator Module in the top bay and the second shelf containing only the Intelligent Terminator Module in the top bay. Both shelves are daisy chained together and connect by a single cable to the host system which must have an Ultra2 LVD Host Adapter installed. The 1/2 Bus switch is set to 2 on both shelves. Figure 3-9 shows how this configuration is cabled.

Figure 3-9. Ultra2 RAID 12-drives



The SCSI ID mapping for this configuration is shown below.

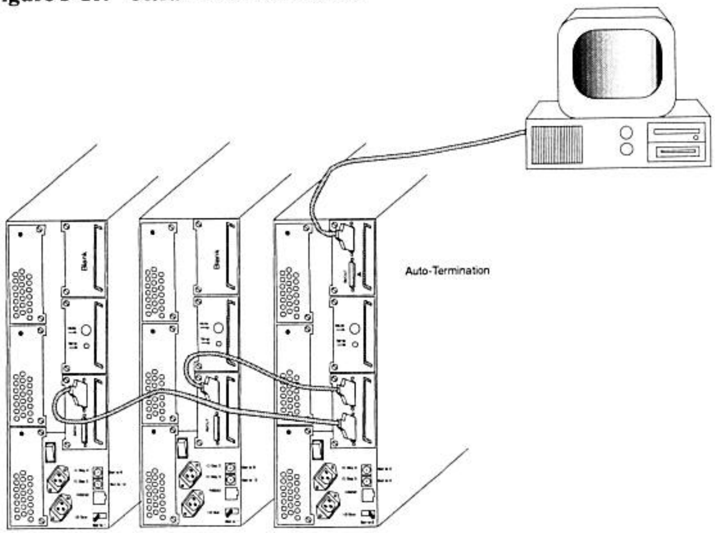
Ultra2 RAID	
Ch0 ID0	
Ch0 ID1	
Ch0 ID2	VEM ID3
Ch1 ID0	
Ch1 ID1	
Ch1 ID2	
Power Sply	
Power Sply	

JBOD Split	
Ch0 ID12	
Ch0 ID13	
Ch0 ID14	VEM ID15
Ch1 ID12	
Ch1 ID13	
Ch1 ID14	
Power Sply	
Power Sply	

Ultra2 RAID 18-drives

This configuration consists of three Voyager 3100 shelves with one shelf containing the Voyager 3110 RAID Controller and the Intelligent Terminator Module. The remaining two shelves both have only the Intelligent Terminator Module installed. The shelves are daisy chained together and connected by a single cable to the host system which must have an Ultra2 LVD Host Adapter installed. The 1/2 Bus switch is set to 2 on the shelf with the RAID Controller installed and is set to 1 on the other 2 shelves. Figure 3-10 shows how this configuration is cabled.

Figure 3-10. Ultra2 RAID 18-drives



The SCSI ID mapping for this configuration is shown below.

Ultra2 RAID	
Ch0 ID0	
Ch0 ID1	
Ch0 ID2	VEM ID3
Ch1 ID0	
Ch1 ID1	
Ch1 ID2	
Power Sply	
Power Sply	

JBOD SGL	
Ch0 ID12	
Ch0 ID13	
Ch0 ID14	VEM ID15
Ch0 ID4	
Ch0 ID5	
Ch0 ID6	
Power Sply	
Power Sply	

JBOD SGL	
Ch1 ID12	
Ch1 ID13	
Ch1 ID14	VEM ID15
Ch1 ID4	
Ch1 ID5	
Ch1 ID6	
Power Sply	
Power Sply	

Fibre Channel RAID Configurations

This section will describe the cabling of the Fibre Channel RAID configurations described in Chapter 1. These configurations have the Voyager 3120 RAID Controller installed in the controller carrier of one of the shelves along with the Intelligent Terminator Module. Subsequent shelves will have only the Intelligent Terminator Module installed in the top slot.

There are five standard Fibre Channel RAID configurations:

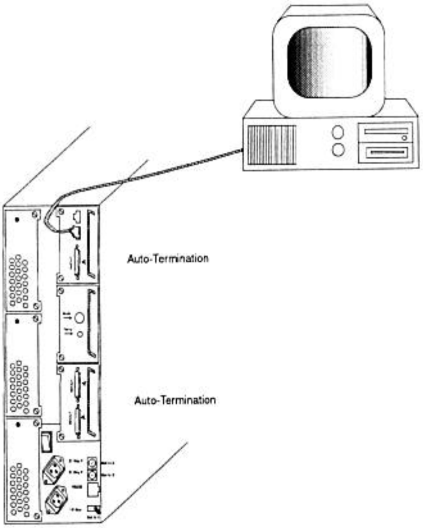
- Fibre Channel RAID 6-drives
- Fibre Channel RAID 12-drive
- Fibre Channel RAID 18-drives
- Fibre Channel RAID 24-drives
- Fibre Channel RAID 30-drives

⚠ **CAUTION: Ensure that the Bus Join Switch is set to 2 (switched to the right) on the disk shelf that contains the RAID Controller.**

Fibre Channel RAID 6-drives

This configuration consists of a single Voyager 3100 shelf with a Voyager 3120 RAID Controller installed in the controller carrier (top bay) along with an Intelligent Terminator Module. A single cable connects to the host system which must have a Fibre Channel Host Adapter installed. The 1/2 Bus switch is set to 2. Figure 3-11 shows how this configuration is cabled.

Figure 3-11. Fibre channel RAID 6-drives



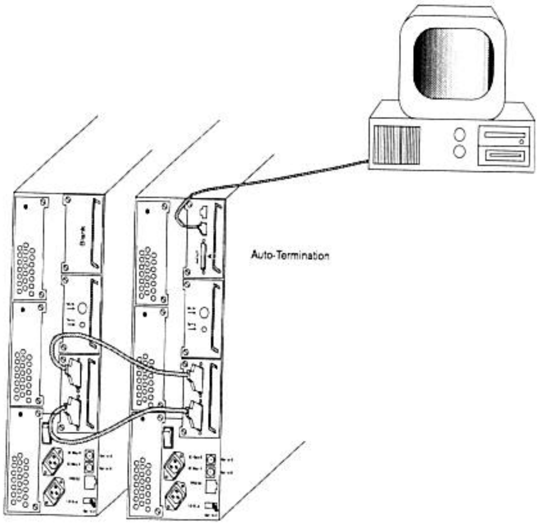
The SCSI ID mapping for this configuration is shown below.

Fibre RAID	
Ch1 ID0	
Ch1 ID1	
Ch1 ID2	VEM ID3
Ch2 ID0	
Ch2 ID1	
Ch2 ID2	
Power Sply	
Power Sply	

Fibre Channel RAID 12-drives

This configuration consists of two Voyager 3100 shelves with one of the shelves containing the Voyager 3120 RAID Controller and an Intelligent Terminator Module in the controller carrier (top bay). The second shelf contains only an Intelligent Terminator Module in the top bay. Both shelves are daisy chained together and connected by a single cable to the host system which must have Fibre Channel Host Adapter installed. The 1/2 Bus switch is set to 2 on both shelves. Figure 3-12 shows how this configuration is cabled.

Figure 3-12. Fibre channel RAID 12-drives



The SCSI ID mapping for this configuration is shown below.

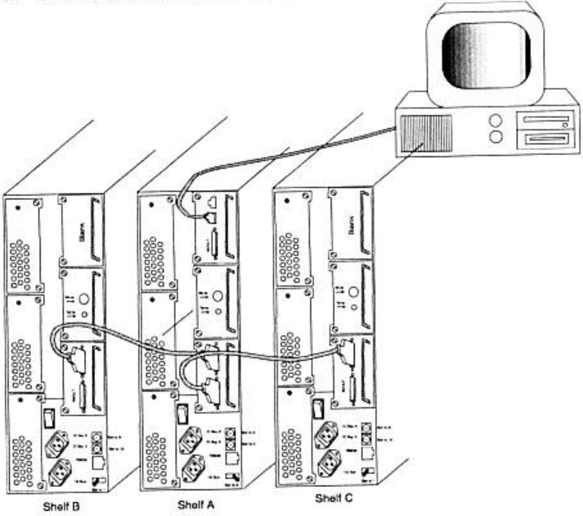
Fibre RAID	
Ch1 ID0	
Ch1 ID1	
Ch1 ID2	VEM ID3
Ch2 ID0	
Ch2 ID1	
Ch2 ID2	
Power Sply	
Power Sply	

JBOD Split	
Ch1 ID12	
Ch1 ID13	
Ch1 ID14	VEM ID15
Ch2 ID12	
Ch2 ID13	
Ch2 ID14	
Power Sply	
Power Sply	

Fibre Channel RAID 18-drives

This configuration consists of three Voyager 3100 shelves with one shelf containing the Voyager 3120 RAID Controller and the Intelligent Terminator Module in the controller carrier (top bay). The remaining two shelves contain only an Intelligent Terminator Module in the top bay (see Figure 3-13). The shelves are daisy chained together and connected by a single cable to the host system which must have a Fibre Channel Host Adapter installed. The 1/2 Bus switch is set to 2 on the shelf with the RAID Controller installed and is set to 1 on the other two shelves. Figure 3-13 shows how this configuration is cabled.

Figure 3-13. Fibre channel RAID 18-drives



The SCSI ID mapping (as viewed from front) for this configuration is shown.

JBOD SGL	
Ch0 ID0	
Ch0 ID1	
Ch0 ID2	VEM ID3
Ch0 ID4	
Ch0 ID5	
Ch0 ID6	
Power Sply	
Power Sply	

Shelf C

Fibre RAID	
Ch1 ID0	
Ch1 ID1	
Ch1 ID2	VEM ID3
Ch2 ID0	
Ch2 ID1	
Ch2 ID2	
Power Sply	
Power Sply	

Shelf A

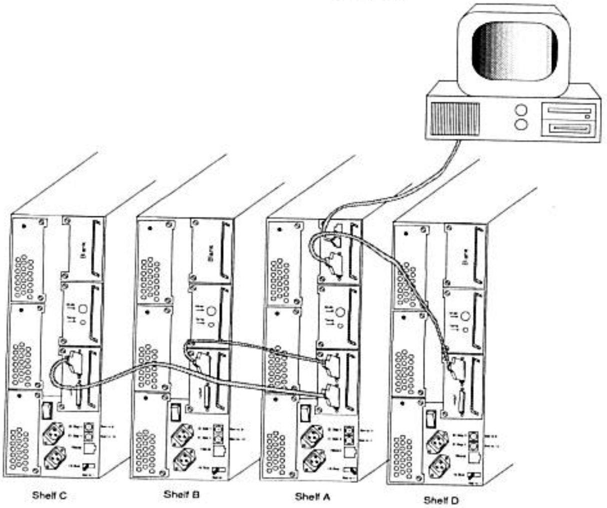
JBOD SGL	
Ch1 ID12	
Ch1 ID13	
Ch1 ID14	VEM ID15
Ch2 ID12	
Ch2 ID13	
Ch2 ID14	
Power Sply	
Power Sply	

Shelf B

Fibre Channel RAID 24-Drives

This configuration consists of four Voyager 3100 shelves with one of the shelves containing the Voyager 3120 RAID Controller and an Intelligent Terminator Module in the controller carrier. The remaining three shelves all contain an Intelligent Terminator Module (see Figure 3-14) in the top bay. The shelves are daisy chained together and connected by a single cable to the host system which must have a Fibre Channel Host Adapter installed. The 1/2 Bus switch is set to 2 on the shelf with the RAID Controller installed and is set to 1 on the other 3 shelves. Figure 3-14 shows how this configuration is cabled.

Figure 3-14. Fibre channel RAID 24-drives



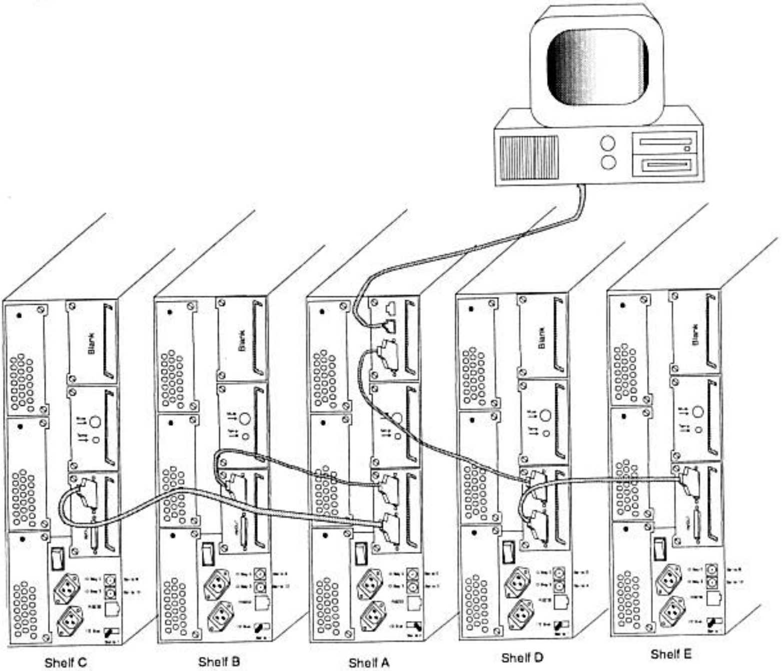
The SCSI ID (as viewed from the front) for this configuration is shown below.

JBOD SGL		Fibre RAID		JBOD SGL		JBOD SGL	
Ch0 ID0		Ch1 ID0		Ch1 ID12		Ch2 ID12	
Ch0 ID1		Ch1 ID1		Ch1 ID13		Ch2 ID13	
Ch0 ID2	VEM ID3	Ch1 ID2	VEM ID3	Ch1 ID14	VEM ID15	Ch2 ID14	VEM ID15
Ch0 ID4		Ch2 ID0		Ch1 ID4		Ch2 ID4	
Ch0 ID5		Ch2 ID1		Ch1 ID5		Ch2 ID5	
Ch0 ID6		Ch2 ID2		Ch1 ID6		Ch2 ID6	
Power Sply		Power Sply		Power Sply		Power Sply	
Power Sply		Power Sply		Power Sply		Power Sply	
Shelf D		Shelf A		Shelf B		Shelf C	

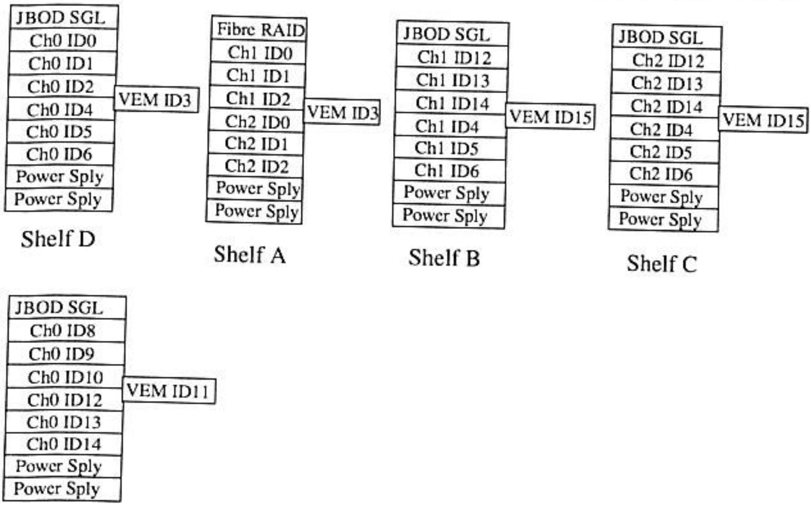
Fibre Channel RAID 30-drives

This configuration consists of five Voyager 3100 shelves with one of the shelves containing the Voyager 3120 RAID Controller and an Intelligent Terminator Module in the controller carrier. The remaining four shelves all contain an Intelligent Terminator Module in the top bay (see Figure 3-15). The shelves are daisy chained together and connected by a single cable to the host system which must have a Fibre Channel Host Adapter installed. The 1/2 Bus switch is set to 2 on the shelf with the RAID controller installed and is set to 1 on the other 4 shelves. Figure 3-15 shows how this configuration is cabled.

Figure 3-15. Fibre channel RAID 30-drives



The SCSI ID mapping (as viewed from the front for this configuration is shown.



Shelf D

Shelf A

Shelf B

Shelf C

Shelf E

Chapter 4: RAID Controller Configuration

This Chapter describes the integrated RAID Controller of the Voyager 3100. A brief description of the RAID controller's features and components will be given. There will also be a step by step guide to the on-screen menu's that allow the user to configure the RAID system.

Important configuration procedures such as Creating and Deleting RAID sets, Adding Spare Drives, etc. will be described in detail.

The Voyager 3100 product uses two types of RAID Controller; the Voyager 3110 Controller and the Voyager 3120 Controller, both of which are described on the next page.

About the RAID Controllers

Both the Voyager 3110 and Voyager 3120 RAID Controllers have been designed to provide RAID 0, 0+1, 3, 4 or 5 (see Appendix B for RAID level details). The controllers are totally independent of the host system operating utility with all RAID functions performed by the controller hardware. In effect, it endows the host system with the high speed and fault tolerant disk storage operation of RAID technology. The Controller allows you to create arrays, delete arrays, add spare drives, monitor array statistics, verify array integrity, change array configurations, monitor drive failures and monitor controller environmental, configuration, and status information.

Voyager 3110 RAID Controller

The RAID Controller installed in the Voyager 3100 is a fault tolerant SCSI-to-SCSI RAID controller that bridges the SCSI interface between the host system and the SCSI hard drive peripherals. It supports single-ended Ultra1 or low voltage differential (LVD) Ultra 2 SCSI buses. The Voyager 3110 RAID Controller has one Ultra2 SCSI host channel and two Ultra2 SCSI disk channels. Each disk channel is a separate SCSI bus.

Voyager 3120 RAID Controller

The Voyager 3120 RAID Controller offers all the features of the Voyager 3110 RAID Controller except that it supports Fibre Channel (FC) connectivity, single loop. The Voyager 3120 RAID Controller has one Fibre Channel (FC) host channel and three Ultra2 SCSI disk channels.

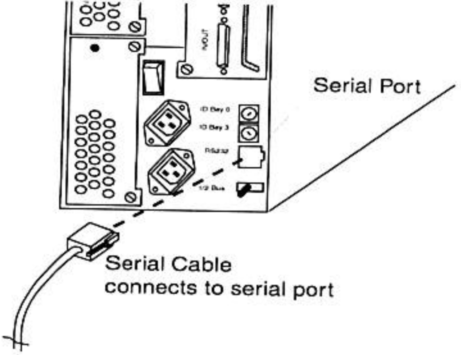
Administrative software is embedded in firmware; thus, both the Voyager 3110 and Voyager 3120 RAID Controllers require no specific software drivers for the host operating system.

Accessing the Voyager 3100 RAID Array Menus

Connecting a Monitor

Run the serial cable supplied with the Voyager 3100 RAID Array to your monitor. The serial cable should be inserted into the serial port on the rear of the Voyager 3100 RAID Array. Figure 4-1 shows where to connect the serial cable.

Figure 4-1. Connecting the Serial Cable



The Terminal should be configured as shown in Table 4-1 and set up for VT100 emulation.

Table 4-1 RS232 Terminal Settings

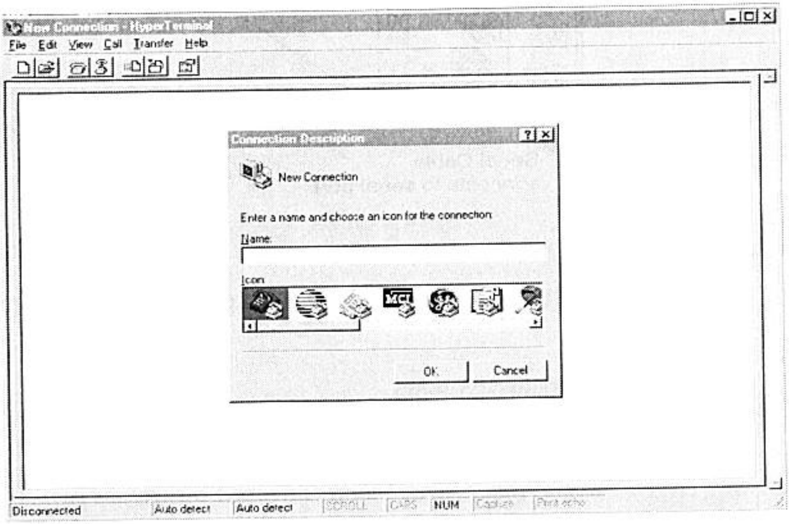
Parameter	Value
Baud Rate	115,200
Data Bits	8
Stop Bits	1
Parity	None
Flow Control	Software (XON/XOFF)
Connector	COM1 (typically)

Emulating a Monitor

If you do not have a dedicated monitor at your disposal, you can still access the Voyager 3100 RAID Array admistrator utility by using a PC and communications software to emulate a monitor. In this example we will use the Microsoft Windows 95 Hyper Terminal program.

Firstly connect the Voyager 3100 RAID Array to the serial port of your system with the cable supplied. Then in Windows 95 select *Start / Programs / Accessories / Hyper Terminal*. Select the *Hypertrm.EXE* option to enter a new session of Hyper Terminal (see Figure 4-2).

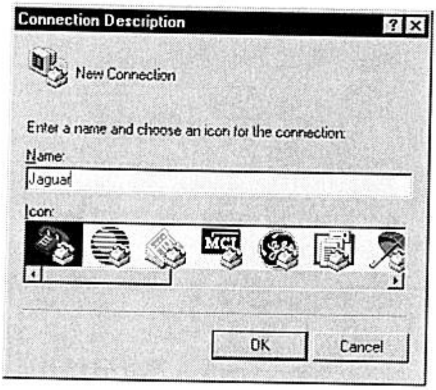
Figure 4-2. HyperTerminal initial screen



Enter a name and choose an icon for the connection:

Enter a name for the connection in the *Connection Description* dialogue box. In this example the connection is called "Jaguar" (see Figure 4-3).

Figure 4-3. Entering a connection name



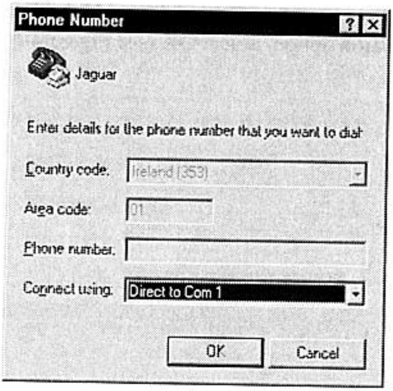
Enter a name and choose an icon for the connection:

Name: Jaguar

Icon:

Pressing OK brings up the *Phone Number* window. In the *Connect Using:* pop-up menu select which COM Port the Voyager 3100 RAID Array is connected to. For example, for COM1 select *Direct to COM 1* (see Figure 4-4).

Figure 4-4. Selecting the COM Port



Enter details for the phone number that you want to dial:

Country code: Ireland (353)

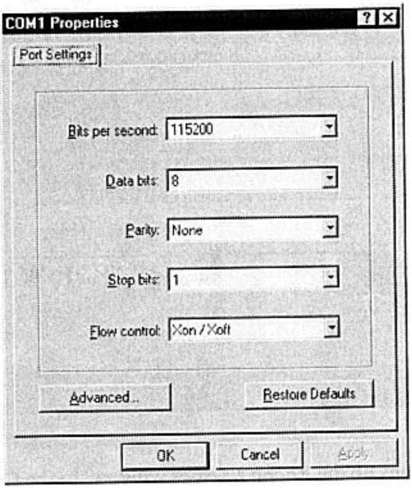
Area code: 01

Phone number:

Connect using: Direct to Com 1

Pressing OK brings up the *COM 1 Properties* window. This window allows you to configure the port settings as shown in Table 4-1 (see Figure 4-5).

Figure 4-5. Configuring Port Settings



Bits per second: 115200

Data bits: 8

Parity: None

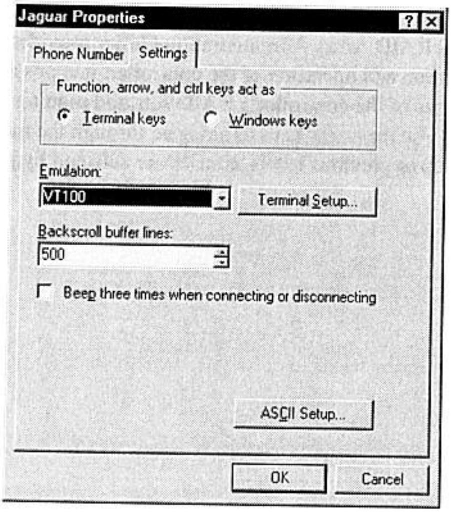
Stop bits: 1

Flow control: Xon / Xoff

Once the port settings have been configured press OK.

From the Main Menu select *File / Properties / Settings*. In the *Function, arrow, and CTRL keys act as* area select *Terminal keys*. In the *Emulation* area select *VT100* as the emulation option. Select OK (see Figure 4-6).

Figure 4-6. Setting Terminal Keys and Emulation



Jaguar Properties

Function, arrow, and ctrl keys act as

● Terminal keys ○ Windows keys

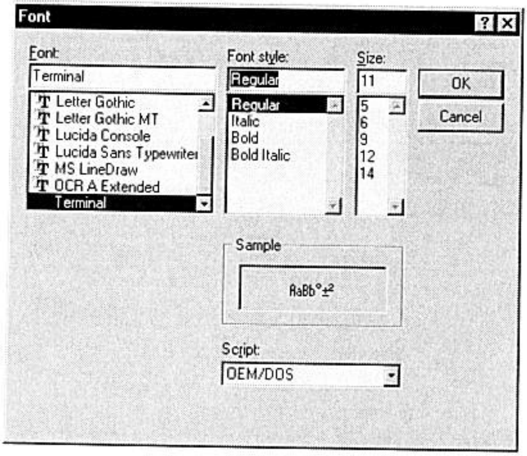
Emulation: VT100

Backscroll buffer lines: 500

☐ Beep three times when connecting or disconnecting

Finally we have to set the correct font to view the Voyager 3100 Administration Utility. From the Main Menu select *View / Font*. From the *Font* pop-up menu select *Terminal* font and press OK (see Figure 4-7).

Figure 4-7. Setting Terminal LEys and Emulation



Font

Font: Terminal

Font style: Regular

Size: 11

Sample: AaBb°±²

Script: OEM/DOS

HyperTerminal is now set up to run the Monitor Utility of the Voyager 3100 RAID Array.

The Voyager 3100 RAID Array Administration Utility provides complete control over the configuration and operation of the controller. It is possible to use the utility to view the status of the controller's RAID sets and monitor the progress of create operations. Use the arrow keys to navigate through the menus and press the ESC key to back up to previous levels. Entries are selected by pressing the Enter key.

3100 Administration Utility

The Administrator Utility allows you to add and delete arrays (a total of seven arrays is possible), display the status of arrays, or go to the Array Menu if you have already added an array, You can also access options for setting up the configuration of the Voyager 3110 and Voyager 3120 RAID Controller's using the Configuration menu. The following sections describe the steps needed to configure the Voyager 3110 and Voyager 3120 RAID Controllers using the Administrator Utility. Figure 4-8 shows the menu options.

Figure 4-8. Administrator Utility Menu Tree

System Menu

- Array Menu
  - Array Status
  - Drive Status
  - Spare Status
  - Array Statisics
  - Verify Function
  - Expand Function
  - Add Spare
  - Delete Spare
  - Change LUN Number
- Add an Array
  - Enter LUN
  - Select RAID
  - Number of Drives
  - Select Drives
  - Stripe Size
  - Number of Spares
- Delete an Array
  - Array#
- Pool Spare Menu
  - Display Pool Spare
  - Add Pool Spare
  - Delete Pool Spare
- Display Drives
  - Channel
  - SCSI ID
  - Size
  - Manufacturer
  - Model Number
- Config Menu
  - Set Date/Time
  - Host Config
  - Channel Config
  - SEP Config
  - New Sample Rate
  - Backoff Percent
  - Alarm Mute
  - Battery
  - Restore Defaults
- Utilities Menu
  - Rescan
  - Hot Swap Pause
  - Hardware Information
  - Drive Utility Menu
- Event Log Menu
  - View Event Log
- Shutdown/Restart

Each of these menu options will be described in following pages.

Creating an Array

To create a new RAID array or to add a new RAID Array to your Voyager 3100 RAID system follow these steps:

Step 1

From the System Menu select `Add an Array` and press `Enter.`

Step 2

Select the array type: RAID 0, 3, 4, 5, Volume (a single drive similar to JBOD except that it includes meta data), or Mirrored. The following table describes the RAID levels and the drive requirements for each level.

Table 4-2 RAID Levels and Drive Requirements

RAID Level	Minimum No. of Drives	Maximum No. of Drives
Volume Set	1	1
0	2	16
3	3	16
4	3	16
5	3	16
Mirrored	2	16

NOTE: A RAID 0+1 array is created when there are more than two drives in a mirrored array (see Appendix B).

Step 3

Select the LUN (Logical Unit Number) number for the Array and press `Enter`. The first number to appear in the menu list is the suggested default LUN assignment.

If the letters *OV* appear before a LUN number, it indicates that the selection overlaps with a soft LUN, probably the bridge LUN. You can create an array at an overlapped LUN number, but it is not visible to the host system until you reboot the controller.

Step 4

Enter the number of drives (excluding spares) you want in the array, and press `Enter`.

Step 5

Select `Select Drives` and press `Enter` to view a menu that displays all available drives, including the following information about each drive:

- Channel
- SCSI ID
- Drive Capacity
- Drive Manufacturer
- Drive Model Number

Step 6

Select the drive(s) you want to add and press `Enter`. To skip a drive, use the up and down arrow keys.

Step 7

If the array is mirrored, RAID 3, 4, or 5 *and* you have one or more drives left, enter the number of spare drives you want to add and press `Enter`. *if you do not want a spare, select* `0`.

NOTE: Spare drives may be dedicated to a specific array or shared (pool) spares. A spare is not available for use in a second array unless it is *explicitly* reassigned as a spare to that array or is a pool spare.

Step 8

If applicable, enter the Stripe Size and press `Enter`.

Step 9

To complete the process, type `Y` to add the array or `N` to cancel.

A message appears notifying you that the array is being created and the percentage completed of the initialization process.

NOTE: Most operating systems, such as Windows NT 4.0, require the system to be rebooted to see the new array. Netware v3.12 and 4.1x can recognize new devices by typing the command `SCAN FOR NEW DEVICES` at the console prompt.

Deleting an Array

NOTE: If the array you are deleting contains a spare, you must first delete the spare before deleting the array.

To delete a RAID Array, follow this procedure:

Step 1

From the System Menu, select `Delete an Array` and press `Enter`.

A list of arrays appears in the menu if more than one array is defined.

Step 2

Select the array you want to delete and press `Enter`.

Step 3

Type `Y` to delete the array, or `N` to cancel the operation.

NOTE: You cannot delete an array while the verify utility is running. You must abort the verify utility before you can delete an array.

Configuration Menu

The configuration menu allows you to configure the following Voyager 3110 and Voyager 3120 RAID Controller parameters:

- System time/date.
- Target SCSI ID or ALPHA (arbitrated loop physical address) and bridge LUN.
- Backend SCSI channel configuration (ID, ultra enable/disable, and SEP LUN).
- Set SEP options.
- Sample Rate.
- Backoff Percent.
- Alarm mute/unmute.
- Battery enable/disable
- Restore default configuration settings.

The following sections describe some of the submenus available under the Configuration menu.

Channel Configuration

With the channel configuration function you can configure individual channels in the controller. Select `Channel Configuration` from the Configuration menu then select the channel you want to configure.

NOTE: Ultra/Ultra2 SCSI is enabled by default. This means that for single-ended bus, transfer rates are 40MBytes/Sec maximum; for an LVD bus, 80MBytes/Sec maximum. If Ultra/Ultra2 is disabled, then the transfer rate for a single-ended bus is 20MBytes/Sec maximum; for an LVD bus it is 40MBytes/Sec maximum. This Ultra SCSI setting only affects the device channel. Host SCSI channel rates are controlled by setting the host adapter.

SEP Configuration Menu

A SEP (SAF-TE processor) is a SCSI device from which the RAID controller can inquire about environmental conditions such as temperature, power supply, and fan status, and the presence or absence of disk drives. The RAID controller can also tell the SEP of RAID activities such as drive rebuilds and failed disk drives.

SAF-TE configuration settings are automatically enabled when the Voyager 3110 or Voyager 3120 RAID Controller is installed in the Voyager 3100 shelf. No changes are required to the default configuration settings to support SAF-TE. There are four SEP configuration settings that can be modified so you can customize the configuration for your environment.

The following are descriptions of the SEP configuration settings:

- **Poll Rate** - specifies the interval, in seconds, the RAID controller polls the enclosure's SEP's for status changes. The default setting is 5 seconds.
- **Temperature** - allows the controller's on-board temperature sensor to provide temperature information to the host along with the enclosure's temperature detected by the SEP. The default setting is `No` (disabled).
- **Slot Flags** - specifies the controller to send commands to the SEP to update the status of each disk drive slot. The default setting is `Yes`.
- **Global Flags** - specifies the controller to send commands to the SEP to update the overall status of the enclosure. The default setting is `No`.

Display Drives

The Display Drives menu contains the following information about each drive connected to the controller:

- Channel
- SCSI ID
- Drive capacity
- Drive Manufacturer
- Model number from SCSI inquiry

Utilities Menu

The Utilities menu contains the following submenus:

- Rescan
- Hot Swap Pause
- Hardware information
- Drive Utility

Hot Swap Pause

NOTE: Always use the Hot Swap Pause option before you remove or replace any drives in an array to ensure data integrity.

Hot Swap Pause suspends activity on all device channels used in the array, thereby assuring data integrity on the connected drives and arrays. To use the Hot Swap Pause option follow this procedure:

1. From the Utilities menu, select Hot Swap Pause and press Enter.
2. When you have replaced the drive, resume SCSI bus activity by pressing 1 or left arrow key

WARNING: Do not stay in the Hot Swap Pause mode for too long; otherwise, an operating system time-out may occur. For example, in Windows NT the limitation during I/O activity is 10 seconds.

Array Menu

If more than one array exists (seven arrays maximum), a list of arrays is displayed and you can select a specific array. The Array menu has options for display status of this array only. These options include:

- Array and drive status
- Array statistics
- Verifying and autocorrecting Mirrored, RAID 3, 4 and 5 arrays

- Expanding arrays
- Adding and deleting spare drives for appropriate RAID levels
- Changing the LUN assignment for this array

Array Status

The Array Status menu displays the following information:

- State - On-line, Some down, Critical, Off-line, and Fault tolerant (depending on the RAID type.
- RAID type
- Number of drives
- Number of spares
- LUN number
- Array size, in MBytes
- Block size
- Writeback cache - enabled or disabled
- Date array was created
- Utility - None, Verify, Reconstruct, Expand, or Initialize

Array Statistics

In the Array Statistics menu, you can view or reset the current statistics. The following statistics are available:

- Read - Total number of reads from the host
- Write - Total number of writes from the host
- SecRd - Total number of sector reads from the host
- SecWt - Total number of sector writes from the host

- Queue Depth - Current number of commands from the host that are active to this LUN.

Verify Function

The verify function allows you to verify the data on the specified array (RAID 3, 4, 5, and mirrored arrays only).

- RAID 3, 4, 5 - Verifies all parity blocks in the selected array and corrects any bad parity.
- Mirrored - Compares the primary and secondary drives. If a mismatch occurs, the primary is copied to the secondary.

To verify an array, follow these steps:

1. Select `Verify Function` from the Array menu and press `Enter`.
2. Select `Start Verify` from the Verify Function menu and press `Enter`.
3. Enter the priority from 0 through 9 (0 assigns it the lowest priority; 9 the highest).

Verification begins, and the percentage of verification completed is displayed.

Expand Function (OCE)

On-line Capacity Expansion (OCE) allows you to expand your array without having to stop I/O activity. It is only possible to expand one array at a time. The expansion of one array must be complete before you can expand another array. The number of drives you can add to an array depends upon the RAID level. See Table 4-3.

Table 4-3 OEC drive additions by RAID level

RAID Level	Number of drive that can be added
RAID 0	1 to 4
RAID 1	Does not support OCE
Volume Set	Does not support OCE
RAID 0 + 1	2 or 4
RAID 3, 4, 5	1 to 4

To expand and array, follow these steps:

1. Select `Expand Function` from the Array menu and press `Enter`.
2. Select `Start Expand` from the Expand function menu and press `Enter`.
3. Enter the priority from 0 through 9 (0 assigns the lowest priority; 9 the highest).

Expansion begins, and the percentage completed is displayed.

Adding a Dedicated Spare Drive(s)

If you create a mirrored, RAID 3, 4, or 5 array without spare drives (RAID 0 arrays never have spares), you can add up to four spare drives later. Spare drives are activated automatically if a drive in the array fails.

For each spare drive you want to add to an array, follow this procedure:

1. Select `Add Spare` from the Array menu.
2. Select each spare drive you want to add and then press `Enter`.
3. Type `Y` to confirm your choice or `N` to cancel it.

Deleting a Dedicated Spare Drive

To delete a spare drive, follow these steps:

1. Select `Delete Spare` from the Array menu.
2. Select the spare drive you want to delete and then press `Enter`. If the array has more than one spare, first select the spare you want to delete. A message appears to confirm the deletion of the spare drive.

You do not need to reinitialize the array when you delete a spare drive.

Adding a Pool Spare Drive(s)

To add a pool spare, follow this procedure:

1. Select `Add Pool Spare` from the Pool Spare menu.
2. Select each spare drive you want to add and then press `Enter`.
3. Type `Y` to confirm your choice or `N` to cancel it.

Using the Bridge Flash Loader Utility (BFLU)

The BFLU is resident in the embedded firmware of the Voyager 3110 and Voyager 3120 RAID Controllers. It can be used to download a new firmware image, to auto-detect your VT100/ANSI terminal baud rate, and to run on-board diagnostics.

The BFLU can be accessed by using a VT100/ANSI terminal connected to the Voyager 3110 or Voyager 3120 RAID Controller through a serial RS232 interface (required for downloading firmware images).

Accessing the BFLU Using a VT-100/ANSI Terminal

When accessing the BFLU the Voyager 3110 or Voyager 3120 RAID Controller will auto-detect your baud rate. Valid baud rates are 9600, 19200, 38400, 57600, and 115200. To speed the download, 115200 is recommended.

To access the BFLU, do the following:

1. Hold down the spacebar on your VT100/ANSI terminal while powering-on the RAID controller. The following menu appears:

```
BFLU

Local Memory Test Passed.

Configuration OKay.

FLASH LOADER v3.002 - July 14 1998 16:17:30
Select Protocol
1. FAST BINARY
2. KERMIT
3. XMODEM
4. Run diagnostics
5. Run bridge
6. Utility Menu
X. Reboot
```

Downloading New Firmware

To download new firmware (*.bfl* or *.fla* files), use options 2 or 3 depending on the file transfer protocols supported by your terminal emulator. See the instructions included with the new firmware image for information.

WARNING: When downloading new a new firmware image, do not interrupt the power.

The Voyager 3110 or Voyager 3120 RAID Controller automatically reboots when downloading is complete.

Running On-board Diagnostics

To run on-board diagnostics, select option **4** from the menu shown above. See Appendix A for error code descriptions and suggested steps for resolution.

Rebooting the RAID Controller

To continue to boot the RAID Controller to the main banner screen with the newly auto-detected baud rate, select option **5** from the above menu.

Chapter 5: Environmental Monitoring

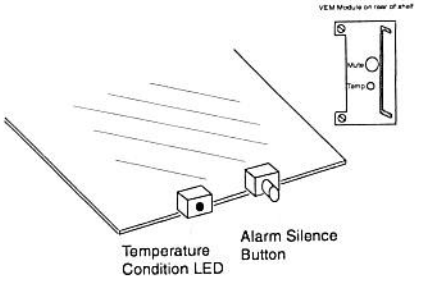
This Chapter deals with the various methods used to monitor the Voyager 3100 RAID Storage Array. There are two methods used as follows:

- Versatile Environmental Monitor (VEM) - The VEM is a card that plugs into the back of the Voyager 3100 RAID Storage Array. The VEM monitors the ACMs, power supply voltage outputs and enclosure temperature. The output from the VEM may be sent to a display unit, or, more comprehensively, may be used as an input to Eurologic's Vision Software.
- Device Carrier LED - All device carriers have two LEDs on the front which are driven by the VEM. These LEDs give details about the operational status of the disk drives and power supplies.

Versatile Environmental Monitor (VEM)

The VEM is primarily an environmental monitoring device. It sits on the backplane of the Voyager 3100 RAID Array. It gathers information about the state of the devices in the Voyager 3100 RAID Array, such as power supplies, disk drives, Advanced Cooling Modules and enclosure temperature. It communicates with the host system using in-band reporting. This section will describe the function of the VEM and how to interpret the LEDs and audible alarm fault indicators. A diagram of the VEM, showing it's main components can be seen in Figure 5-1.

Figure 5-1. Versatile Environmental Monitor



VEM Function

There are three main functions of the VEM. These functions are as follows:

- Collect data from the various "sensors" in the enclosure. Monitor this data, and activate various visible and audible indicators to denote failures and other conditions in the enclosure.
- Report the collected data to a host application using a variety of communications interfaces and data formats.
- Receive "control" information from a host application (using a variety of communications interfaces and data formats) and carry out the "commands" contained therein.

In-Band Reporting

The Versatile Environmental Monitor (VEM) communicates with the host system using in-band reporting. The VEM supports both SAFTE and SES protocols. The VEM card sits on the SCSI bus and communicates directly to the host(s). The VEM card has it's own SCSI ID (see below) and is seen as a separate target by the host(s).

VEM SCSI ID

The VEM sits on the SCSI bus and as such it is assigned a SCSI ID. The VEM is assigned a SCSI ID of 3 for single shelf configurations and a SCSI ID of 3 and 7 for dual shelf configurations that have a VEM in each shelf. For more details on the SCSI ID mapping refer to "Setting the SCSI ID's" in Chapter 3.

VEM Fault Notification

The VEM has an LED mounted on it to warn of over temperature conditions. If an over temperature condition exists, the temperature LED (Temp) will come on, and the alarm buzzer will sound. The alarm buzzer can be turned off by using the Alarm Silence Button (Mute) on the VEM card.

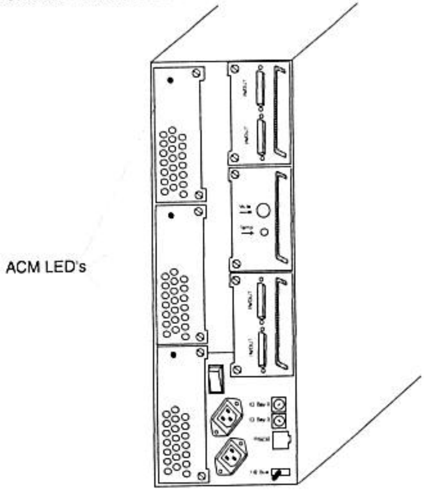
NOTE: The alarm silence button (Mute) temporarily silences the alarm buzzer; it does not stop the error LEDs from flashing.

In addition to the temperature LED mounted on the VEM card, the VEM also drives fault LEDs mounted on each ACM assembly, Power Supply Carrier and Disk Drive Carrier.

Advanced Cooling Module Failure LEDs

Each ACM has a fault LED built into it as can be seen in Figure 5-2.

Figure 5-2. ACM Failure LED

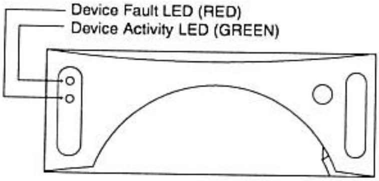


If an ACM fails the ACM Failure LED on the failed ACM will come on, and the alarm buzzer on the VEM card will sound. The alarm buzzer may be silenced by pressing the alarm silence button.

Disk Drive Carrier LEDs

Each disk drive carrier in a disk shelf has two LED indicators on the front as shown in Figure 5-3. These LED indicators are driven by the VEM.

Figure 5-3. LEDs on disk drive carrier



The disk drive LEDs function as follows:

- The Green LED on the top is the device activity indicator. It is on or flashing when the disk is active.
- The Red LED on the bottom is the the device fault indicator. This LED is steadily on when the disk has failed[1].

Table 5-1 shows how to interpret the LEDs.

---

[1] This LED will, at the hosts request, flash when the Disk Drive is spinning up or down.

Table 5-1 Device carrier LED definitions

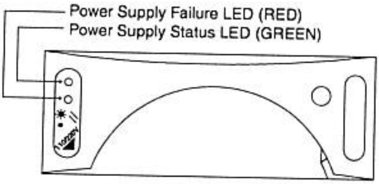
Device fault LED	Device activity LED	Meaning
Off	On	Disk operates normally
Off	Flashing	Disk operates normally
Off	Off	Disk is inactive and there is no fault
On	On	Fault status. Disk may not be responding to control signals and may be bad, or may need a power-off reset. If the problem persists, replace the disk.
On	Off	Fault status. Disk is inactive and spun down. Replace the disk.
Flashing[a]	On	Disk is spinning up or down during a hot swap, or spinning down because of an error.
Flashing[a]	Off	Fault status. Disk has failed. Replace the disk.

[a] This will only happen at the request of the host system.

Power Supply Carrier LEDs

The power supply for the disk shelf has two LED indicators (see Figure 5-4). These LED indicators are driven by the VEM.

Figure 5-4. LEDs on power supply carrier


Power Supply Failure LED (RED)
Power Supply Status LED (GREEN)

These power supply status LEDs function as follows:

- The Green LED on the top is the power supply failure LED. It is normally off. If a failure has occurred, this LED turns on steadily or flashes at regular intervals. See Table 5-2 for the meaning of the LED interval patterns.

Table 5-2 Power supply LEDs

LED color/location	LED activity	Meaning
Green - top	On	Power supply is functioning properly.
	Off	An input power problem exists or the power supply is not functioning properly.
Red - bottom	Off	Power supply is functioning properly
	On	Power supply malfunction or input power problem exists.

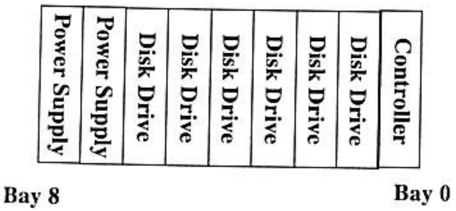
Chapter 6: Replacing Components

This chapter deals with replacing components in the Voyager 3100 RAID Array from a field replaceable point of view. It will go through the procedure for removing and installing components such as the RAID Controller, disk drives, power supplies, ACMs and the VEM.

Device Insertion and Removal

The position of the power supplies and the disk drives within the tower is shown in Figure 6-1.

Figure 6-1. Location of devices in the Voyager 3100 shelf



WARNING: Before attempting to install or remove any of the components, ensure that anti-static precautions have been taken. The minimum requirement is an anti-static wrist strap and grounding wire.

Power Supply Insertion and Removal

Power supplies are housed in removable carriers to allow for easy insertion and removal. The power supply is designed for hot swappable operation. If removing and replacing the same power supply you must ensure that at least one (1) minute has elapsed between removal and re-insertion. This is necessary to allow components to cool to ambient temperatures.

Removing a Power Supply

To remove a power supply unit follow this procedure:

1. Press the ejection button on the front of the power supply carrier.
2. With the ejection button still pressed grasp the carrier handle and slowly pull the power supply out of the shelf. Use both hands to support the weight of the power supply.

Inserting a Power Supply

To install a power supply unit follow this procedure:

1. Orient the power supply carrier so that the LEDs are on the left and the ejection button is on the right (for rackmount system the LEDs and Ejection button are on the top and bottom respectively).
2. Insert the power supply carrier into either Bay 7 or Bay 8 of the shelf (see Figure 6-1).
3. Push the carrier into the bay until you feel the power supply engage the backplane and the ejection button on the front is fully extended. If the button is not fully extended, apply additional pressure to the front of the device carrier.

Disk Drive Insertion and Removal

Disk drives are housed in device carriers to allow for easy insertion and removal. Prior to removal of the disk drive from the shelf, you must ensure that the disk drive has fully spun down. This is necessary as centrifugal forces may damage the drive. Allow a minimum period of one minute for the drive to spin down completely. You must make sure that adequate shock precautions are complied with.

WARNING: Before removing a disk drive you must ensure that there is no I/O activity on the drive.

Removing a Disk Drive

To remove a disk drive follow this procedure:

1. Press the ejection button on the front of the disk drive carrier.
2. With the ejection button still pressed grasp the carrier handle and slowly pull the disk drive out of the shelf. Use both hands to support the weight of the disk drive.

Installing a Disk Drive

To install a disk drive follow this procedure:

1. Orient the disk drive carrier so that the LEDs are on the left and the ejection button is on the right (for rackmount systems the LEDs and ejection button are on the top and bottom respectively).
2. Insert the disk drive carrier into any of the Bays 1 through 6 of the tower (see Figure 6-1).
3. Push the carrier into the bay until you feel the disk drive engage the backplane and the ejection button on the front is fully extended. If the button is not fully extended, apply additional pressure to the front of the carrier.

RAID Controller Insertion and Removal

The RAID controller is housed in a removable device carrier to allow for easy insertion and removal. The RAID controller carrier can contain the Voyager 3100 Intelligent Terminator Module and one of either the Voyager 3110 or Voyager 3120 RAID Controllers.

Removing a RAID Controller

1. Insert the carrier key supplied into the key hole on the controller carrier.
2. Turn the key anti-clockwise to disengage the carrier from the shelf.
3. Slowly pull the carrier out of the shelf.

Installing a RAID Controller

1. Orient the controller carrier so that the key hole is on the right.
2. Insert the key into the keyhole and insert the controller carrier into the top bay of the disk shelf.
3. Turn the key clockwise to secure the controller carrier in position.

Advanced Cooling Module Insertion and Removal

The Voyager 3100 RAID Array is supplied with three ACMs mounted on the rear of each shelf. The ACMs are removable and hot swappable. The air flow created by the ACMs is from front to rear.

WARNING: Once you have removed an ACM from the shelf you must block the resulting hole within 3 minutes. The hole may be blocked by installing a new ACM or by replacing the failed ACM until a replacement is obtained. Failure to do so can seriously disrupt air flow.

Removing an Advanced Cooling Module

To remove an Advanced Cooling Module from the shelf follow this procedure:

1. Loosen the two captive thumbscrews that secure the ACM to the shelf.
2. Pull the ACM assembly out of the shelf.

Installing an Advanced Cooling Module

To install an Advanced Cooling Module in a shelf follow this procedure:

1. Hold the ACM assembly at 90 degrees to the shelf.
2. Insert the ACM into the empty ACM slot.
3. Align the two captive thumbscrews on the ACM with the threaded holes on the shelf.
4. Tighten the thumbscrews.

Appendix A Troubleshooting

In this section resolutions to common problems you may encounter are described.

Terminal Emulator and COM Port Problems

Problem: Screen continuously puts out garbage characters

The likely cause of this problem is a baud rate mismatch between the terminal emulator and the Voyager 3110 or Voyager 3120 RAID Controller. The default baud rate is 115,200. Follow these steps if you set your terminal emulator to this rate and still get garbage characters:

1. Shut off the power to the Voyager 3100 shelf.
2. Press the space bar of your terminal emulator.
3. Turn on the power while continuing to hold down the space bar. This will allow the controller to auto-detect the baud rate setting.
4. When the BFLU appears, select option 5 to continue to boot the controller.

NOTE: Some terminal emulators don't immediately change to the new baud rate settings, and you have to exit and restart the emulator to use the new settings.

Problem: Nothing is displayed on the terminal emulator.

The probable cause of this problem is a bad RS232 cable connection or swapped transmit/receive lines. If the cable is properly connected on both ends, try a null modem adapter that will reverse the RS232 transmit and receive signals.

Problem: Screen is updated, but won't respond to keystrokes.

Disable hardware flow control on the terminal or terminal emulator. The Voyager

3110 or Voyager 3120 RAID Controller supports XON/XOFF flow control and works properly in most cases with no flow control.

Problem: Screen looks correct, but clock is not being updated

Check to be sure that the Voyager 3100 shelf is still powered on. If you are using XON/XOFF, press the Ctrl key and the Q key simultaneously.

Problem: Screen is updated and menus appear right, but boxes around menus look incorrect.

Try a different font in your terminal emulator program, such as *Terminal*. If you cannot find a font that looks correct, set ASCII Display to `Yes` in the Display options item of the Configuration menu.

Host SCSI Channel Problems

Problem: The host SCSI BIOS scan displays "Device name not available".

The Voyager 3110 or Voyager 3120 RAID Controller is properly connected, but no arrays have been created. Use the Administration Utility to create an array and reboot the host system.

Problem: The host SCSI BIOS scan hangs.

Check that termination is set correctly. Check that the device ID set in the Administration Utility does not conflict with any other devices on the host SCSI channel. If you have a long SCSI cable, try disabling Ultra on the host SCSI channel.

Problem: Only one array is displayed during host SCSI BIOS scan

Check to ensure that LUN support is enabled. Most SCSI host adapters ship with LUN support disabled by default. Use Display Array Status to check the LUN assignment for each array. If LUN 0 is not assigned to an array, or some other LUN numbers are skipped, use the Change LUN Assignment option for each array until you have LUN numbers starting at 0 with no LUNs skipped. You must reboot the host system to recognize the new LUN assignment.

Problem: All arrays are displayed during host SCSI BIOS scan, but only one array is seen by the operating system.

SCSI drivers for some operating systems require a parameter switch to enable LUN support. For example, the NetWare driver, *aic7870.dsk*, requires the driver parameter LUN_ENABLE=FF (in *startup.ncf*) to scan for all LUN's. Check the driver documentation for your host SCSI channel. You may also need to compact the LUN mapping.

Problems During Bootup

The following sections describe problems you encounter during Power On Self-Test (POST) or during bootup and explain how to resolve those problems.

Problem: Controller failed the on-board memory test.

When this failure occurs, it means that the internal CPU memory failed. Replace the controller to correct the problem.

Problem: System hangs at **Loading Bridge** *during BFLU Loader Menu.*

Reflash the firmware to ensure that you are using the latest version. See "Downloading New Firmware" on page 4-20. If you cannot update the firmware or if the updated firmware does not correct the problem, replace the controller.

Problem: One of the POST Diagnostic tests failed

Use the information in the following table to find solutions to a particular diagnostic failure. First confirm any failure you may encounter by running the individual test from the Diagnostics menu. See "Running the diagnostics menu" on page A-5.

Diagnostic Failure	Solutions
Default hardware register	Replace the controller
Default chip set register	Replace the controller
Voltage / temperature	1. Check the enclosure to make sure it is properly supplying Vcc and +12 V. 2. Check for thermal problems in the Voyager 3100 shelf. 3. Replace the controller
Local DRAM memory test	Replace the controller
LVDS BIST	Replace the controller
PCI configuration verification	Replace the controller
SCSI device SCB SRAM	Replace the controller
SCSI device scratch RAM	Replace the controller
I^2C chip	1. Check the backplane and the Voyager 3100 shelf. 2. Replace the controller.
Cache memory	1. Reset the DIMM to make sure it is properly installed. 2. Make sure you are using an approved DIMM vendor. 3. Replace the DIMM 4. Replace the controller
Programmable interval timer	Replace the controller
Real-time clock chip	Replace the controller
Battery	1. Check the battery to make sure that it is fully connected. 2. Check the battery cable to make sure that it is not broken. 3. Replace the battery 4. Replace the controller
Daughter board	1. Check the firmware to make sure it matches the hardware configuration. 2. Make sure the daughterboard is properly seated. Repeat if necessary. 3. Replace the controller

Problem: The system hangs at CT_srv starting.

Follow these steps to resolve the problem:

1. Check the disk channels to make sure they are properly terminated.
2. Check the Voyager 3100 shelf to make sure everything is properly connected.
3. If the shelf and the drive work properly, replace the controller.

Problem: The system hangs during a drive scan.

Follow these steps to resolve the problem:

1. Check the Voyager 3100 shelf to make sure everything is properly connected.
2. Remove and replace the drive that failed the scan.
3. If the Voyager 3100 shelf and the drive are working properly, replace the controller.

Problems Navigating Through Menu Options

Problem: Pressing the 1, 2, 3, or 4 keys does not move through the Administrator Utility menus.

Follows these steps to resolve the problem:

1. Check the terminal configuration. See "3100 Administration Utility" on page 4-9.
2. Check the RS232 cable and connectors.
3. Replace the controller.

Running the Diagnostics Menu

A set of diagnostics is run each time you boot the controller. To run an individual test, follow these steps:

1. While booting the controller, hold down the spacebar. The Loader menu appears.
2. Select **`4. Run diagnostic`**.

3. Enter the number or letter of the particular test you want to run.

If you have any diagnostic errors, see the table on page A-4 for descriptions and solutions.

Problem: When I try and run the diagnostics, it hangs at loading diagnostics.

Update the firmware. See "Downloading New Firmware" on page 4-20.

Using the Utility Menu

You can use the Utility Menu to initialize the controller if it had a previous configuration. For example, you need to clear the configuration if you are adding a new controller to an existing array. Also, you can clear the battery backup if the controller is using battery backup but you do not want the data.

To run the Utility menu, follow these steps:

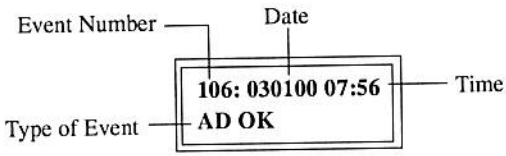
1. While booting the controller, hold down the space bar. The Loader menu appears.
2. Select `6. Utility Menu`.
3. Enter the number of the utility you want to run.

Event Logs

To view the Event Logs, follow these steps:

1. Select `Event Logs`, from the System Menu.

Figure 1. Event Log Screen



```
106: 030100 07:56
AD OK
```

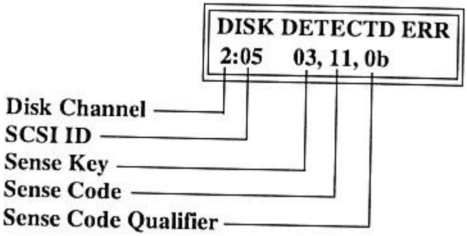
NOTE: Event numbers restart at 0 after 999 events have been

logged.

2. Use the up and down arrow keys to browse through the list of events.
3. Press `4` or `Enter` to view details about the event.

Disk Detected Errors

The figure below shows a typical disk detected error.



Using the information in the tables on page A-4 and A-8, we can discern that this is a medium error, unrecovered read error - recommended reassignment. The following table lists the sense key descriptions (in hexadecimal).

Sense Key	Description
0h	No sense
1h	Recovered error
2h	Not ready
3h	Medium error
4h	Hardware error
5h	Illegal request
6h	Unit attention
7h	Data protect
8h	Blank check
9h	Vendor-specific
Ah	Copy aborted
Bh	Aborted command
Ch	Obsolete
Dh	Volume overflow
Eh	Miscompare
Fh	Reserved

The following table lists the descriptions for the most common sense codes (ASC) and sense code qualifiers (ASCQ), all in hexadecimal, see the *SCSI Primary Commands - 2 (SPC-2) Specification* for a complete list of ASC and ASCQ descriptions.

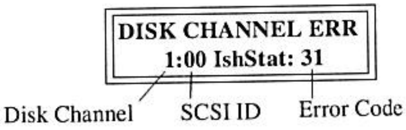
ASC	ASCQ	Description
0C	02	Write error - auto reallocation failed
0C	03	Write error - recommend reassignment
0C	04	Compression check miscompare error
0C	05	Data expansion occurred during compression
0C	06	Block not compressible
11	00	Unrecovered read error
11	01	Read retries exhausted
11	02	Error too long to correct
11	03	Multiple read errors
11	04	Unrecovered read error - auto reallocate failed
11	0B	Unrecovered read error - recommend reassignment
11	0C	Unrecovered read error - recommend rewrite the data
47	00	SCSI parity error
48	00	Initiator detected error message received

Disk Channel Errors

Disk channel errors occur while talking to backend devices that are detected by the controller rather than the disk drive. An example is a parity error on data received from a disk drive.

Some disk channel errors are displayed as text strings, others are displayed as hexadecimal codes. Figure 2 shows an example of a disk channel error displaying the hexadecimal code. The next table shows a list of error codes and descriptions. Most disk channel errors are informational since the controller issues retries to correct any problem.

Figure 2. Disk Channel Error Screen



```
DISK CHANNEL ERR
    1:00 IshStat: 31
```

Code	Description
04	Data overrun or underrun occurred while getting sense data
05	Request for sense data failed
20	Selection time-out (displayed as "Sel Timeout")
21	Controller detected an unrecoverable protocol error on the part of the target
22	Unexpected bus-free condition (displayed as "Unex Bsfree")
23	Parity error on data received from a target (displayed as "Parity Err")
24	Data overrun or underrun has been detected
30	Target reported busy status (displayed as "Device Busy")
31	Target reported queue full status
32	Target has been reserved by another initiator
40	Controller aborted an I/O request to this target because it timed out (displayed as "I/O Timeout")
41	I/O request was aborted because of a channel reset
42	I/O request was aborted of controllers decision to reset the channel
43	I/O request was aborted because of a third-party channel reset
44	Controller decided to abort I/O request for reasons other than bus or target reset
45	I/O request was aborted because of target reset requested by controller
46	Target did not respond properly to abort sequence
4B	I/O aborted due to operating mode change (such as LVD to SE or SE to LVD)
50	Disk channel hardware failure (displayed as "DisChn Fail"). This may be the result of bad termination or cabling.

Voltage and Temperature Errors and Warnings

First check the 3100 shelf and ensure that no vents are blocked and that all advanced cooling modules are operating correctly.

Appendix B: RAID Basics

RAID stands for Redundant Array of Independent Disks[1]. Some of the advantages of using a RAID storage subsystem are:

- Provides disk spanning by weaving all connected drives into one single volume.
- Increases disk access speed by breaking data into several blocks for reading/writing it to several drives in parallel. With RAID storage, speed increases as more drives are added. Without RAID, the speed slows down as more drives are installed.
- Provides fault-tolerance by mirroring or parity operation.

RAID 0

Block Stripping - Data is broken into blocks, the size of a SCSI disk block, and striped across several drives.

Drive 0	Drive 1	Drive 2	Drive 3	Drive 4
A0	A1	A2	A3	A4
B0	B1	B2	B3	B4
C0	C1	C2	C3	C4
D0	D1	D2	D3	D4

---

1. RAID Advisory Board Definition

RAID 1

Mirroring and Striping[2] - A copy of the same data is recorded onto two sets of striping drives. In the event of a failure, the duplicate set continues operation.

Set 1					Set 2			
Drive 0		Drive 1				Drive 0		Drive 1
À0		A1				À0		A1
A2		A3				A2		A3
A4		B0				A4		B0
B1		B2				B1		B2

RAID 3

Block Striping with Dedicated Parity - Data is broken into logical blocks, the size of a SCSI disk block, and striped across several drives. One drive is dedicated to parity. In the event of failure, original data is re-generated from the parity information.

Drive 0		Drive 1		Drive 2		Drive 3		Drive 4
À0		A1		A2		A3		P
A4		B0		B1		B2		P
B3		B4		C0		C1		P
C2		C3		C4		D0		P

---

[2] When 2 drives are used a pure RAID 1 RAID set is generated. Even numbers of drives greater than two will result in a striped array of mirrored pairs which is RAID 0+1.

RAID 4

RAID 4 breaks up host data into chunks, calculating parity by performing an exclusive-OR on the chunks, and then writes the chunks to all but one drive in the array with the parity information written to the last drive. When the host requests data from the disk drives, the controller retrieves the chunks containing the addressed data, reconstitutes the data from the chunks, and passes the data to the host.

In the event of a single drive failure a RAID 4 array will continue to operate in degraded mode. If the failed drive is a data drive, writes will continue as normal, except no data will be written to the failed drive. Reads will reconstruct the data on the failed drive by performing an exclusive-OR operation on the remaining data in the stripe and the parity of that stripe. If the failed drive is a parity drive, writes will occur as normal, except no parity will be written. Reads will simply retrieve data from the data disks. There will be no deterioration in controller performance while a RAID set is on degraded mode.

In general RAID 4 is best suited to applications such as graphics, imaging, or video that call for reading and writing huge sequential blocks of data. However you may find that RAID 4 is preferable to RAID 5 even for applications characterized by many small I/O operations, such as transaction processing. This is due to the controller's intelligent caching, which efficiently handles small I/O reads and writes, and to the relatively less complex algorithms needed to implement RAID 4.

The benefits of RAID 4 disappear when you have many, small I/O operations scattered randomly and widely across the disks in the array. RAID 4's fixed parity disk becomes a bottleneck in such applications, as the following example illustrates. Let's say the host instructs the controller to make two small writes. The writes are widely scattered, involving two different stripes and different disk drives. Ideally, you would like both writes to take place at the same time, but RAID 4 makes his impossible, since the writes must take turns accessing the fixed parity drive. For this reason, RAID 5 is the better choice for widely scattered, small write operations.

WARNING: RAID 4 can withstand a single drive failure and handle I/O activity without interruption in degraded mode until the failed drive is rebuilt. If a second drive fails while the RAID set is in degraded mode, the entire RAID set will fail.

RAID 5

Multiple Block Striping with Distributed Parity - Sets a given number of logical blocks[3] as a unit for striping across a number of drives. For small Read/Write operations, one drive may be activated for improved small record access speed. In this case we can process multiple I/O requests simultaneously. Parity information is interleaved across the drive array. In the event of failure, original data is regenerated from the parity information.

Drive 0		Drive 1		Drive 2		Drive 3		Drive 4
A0 - A1		A2 - A3		A4 - B0		B1 - B2		P
B3 - B4		C0 - C1		C2 - C3		P		C4 - D0
D1 - D2		D3 - D4		P		E0 - E1		E2 - E3
E4 - F0		P		F1 - F2		F3 - F4		G0 - G1

Required Number of Drives and Net Capacity

The following table gives a summary of the minimum number of drives required and the capacity available for different types of RAID operation:

Operation	Min. Drives	Capacity
RAID 0	2	T
RAID 1	2	T / 2
RAID 0 + 1	4	T / 2
RAID 3	3	T x (n - 1) / n
RAID 5	3	T x (n - 1) / n

T = Sum of the capacity of all connected drives

n = Number of connected drives

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[3] This given number of blocks is known as the chunk size.